



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 102 349 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
17.03.2004 Bulletin 2004/12

(51) Int Cl.7: **H01Q 19/10**, H01Q 9/28,
H01Q 1/42, H01Q 1/24,
H01Q 1/00

(43) Date of publication A2:
23.05.2001 Bulletin 2001/21

(21) Application number: **00124374.0**

(22) Date of filing: **20.11.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**
Designated Extension States:
AL LT LV MK RO SI

- Manassero, Greg A.
San Jose, CA 95129 (US)
- Belingheri, Ralph A.
Woodside, CA 94062 (US)
- Rucker, Donald L.
Santa Cruz, CA 95060 (US)
- Humphrey, Brent R.
San Jose, CA 95139 (US)

(30) Priority: **22.11.1999 US 447166**

(71) Applicant: **Northrop Grumman Corporation**
Los Angeles, CA 90067-2199 (US)

(74) Representative: **Schmidt, Steffen J., Dipl.-Ing.**
Wuesthoff & Wuesthoff,
Patent- und Rechtsanwälte,
Schweigerstrasse 2
81541 München (DE)

(72) Inventors:
• **Jennetti, Anthony G.**
Sunnyvale, CA 94086 (US)
• **Serrano, Francisco J.**
Los Gatos, CA 95032 (US)

(54) **High performance, directional cellular band antenna**

(57) An indoor cellular band antenna (10) that is low cost, easy to assemble, easy to manufacture, and has better performance than those antennas existing in the art. The antenna (10) has an outer metal housing (12) including angled side panels (22, 24), trapezoidal-shaped top and bottom panels (18, 20) and a rectangular shaped back panel (26) defining a 90° truncated corner configuration. A radome (14) is positioned over the front of the housing (12) by sliding it beneath extending clips (30) formed to the side panels (22, 24). An antenna dipole (16) is mounted in the housing (12) and includes two dipole members (42, 44). Each dipole member (42, 44) includes a rectangular dipole element (46, 58), extended transmission balun members (52, 59) and a back mounting plate (54, 61) formed from a single piece of

metal. The transmission balun members (52, 59) are parallel to each other and specially spaced to provide a predetermined and electromagnetic coupling between the dipole members (42, 44). An antenna cable (36) extends through the top panel (18) of the housing (12). An outer conductor (62) of the cable (36) is electrically connected to one of the transmission balun member (52) of one dipole member (42) and an inner conductor (60) is electrically connected to the dipole element (46) of the same dipole member (42). The inner and outer conductors (60, 62) of the cable (36) are mounted to the dipole member (42) by connectors (64, 70) formed from the dipole member (42).

EP 1 102 349 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 12 4374

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)	
X	US 5 274 391 A (CONNOLLY KEVIN J) 28 December 1993 (1993-12-28) * column 3-5; figures 1-3 *	1,11,12, 20	H01Q19/10 H01Q9/28 H01Q1/42 H01Q1/24 H01Q1/00	
Y		2-6, 13-16, 21,23		
Y		9,10,22		
Y	US 5 629 713 A (MAILANDT PETER ET AL) 13 May 1997 (1997-05-13) * figure 8A *	2-6, 13-16, 21,23		
A	US 5 724 051 A (HUYNH TAN D ET AL) 3 March 1998 (1998-03-03) * figures 5-7 *	2,3,21		
A	US 5 691 735 A (BUTLAND ROGER JOHN ET AL) 25 November 1997 (1997-11-25) * figure 3 *	2,21		
A	GB 2 191 045 A (GEN ELECTRIC CO PLC) 2 December 1987 (1987-12-02) * figure 3 *	2,4-6, 21,23		TECHNICAL FIELDS SEARCHED (Int.Cl.7)
Y	US 3 750 185 A (EVANS G) 31 July 1973 (1973-07-31) * figure 2 *	9,10,22		H01Q
A		13-16		
A	US 5 625 365 A (DENNINGER VALENTINE L ET AL) 29 April 1997 (1997-04-29) * figure 1 *	11		
A	US 5 710 569 A (OH JUNG KUN ET AL) 20 January 1998 (1998-01-20) * figure 2A *	9,10, 13-16,22		
The present search report has been drawn up for all claims				
Place of search MUNICH		Date of completion of the search 8 January 2004	Examiner R1bbe, J	
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>				

EPO FORM 1500 01.02 (P04-02/01)



European Patent
Office

Application Number
EP 00 12 4374

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent
Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 00 12 4374

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-8, 20-21, 23

Mounting plates and balun details.

2. Claims: 9-10, 13-19, 22

Housing panels.

3. Claim : 11

Radome details.

4. Claim : 12

Operation frequencies.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 12 4374

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-01-2004

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5274391	A	28-12-1993	NONE		
US 5629713	A	13-05-1997	NONE		
US 5724051	A	03-03-1998	EP WO	0870345 A1 9723019 A1	14-10-1998 26-06-1997
US 5691735	A	25-11-1997	AU AU JP WO NZ	670130 B2 4986293 A 7509822 T 9403940 A1 255598 A	04-07-1996 03-03-1994 26-10-1995 17-02-1994 25-06-1996
GB 2191045	A	02-12-1987	NONE		
US 3750185	A	31-07-1973	NONE		
US 5625365	A	29-04-1997	NONE		
US 5710569	A	20-01-1998	KR DE DE DK EP ES	185962 B1 69514206 D1 69514206 T2 730319 T3 0730319 A1 2141273 T3	15-05-1999 03-02-2000 13-07-2000 19-06-2000 04-09-1996 16-03-2000

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82